

REMARKS

It is further noted that, notwithstanding any claim amendments made herein, Applicants' intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1-12 are all of the claims pending in the present Application. Claims 13-20 are canceled above, although Applicants continue to maintain that the Examiner fails to follow the procedure for a restriction requirement under MPEP §806.05(f). Applicants hereby cancel these claims as a good faith effort to expedite prosecution for pending claims.

Claims 1-12 are rejected under 35 USC § 112, first paragraph, as failing the written description requirement. Claim 4-6 are rejected under 35 USC § 112, second paragraph, as being indefinite. Claim 11 stands rejected under 35 USC §103(a) as unpatentable over US Patent 5,837,428 to Huang and claim 12 stands rejected under 35 USC §103(a) as unpatentable over US Patent 6,599,437 to Yauw.

Applicants gratefully acknowledge the Examiner's indication that claims 1-3 and 7-10 would be allowable once the above rejections for 35 USC §112 are overcome.

These rejections are respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

As described and claimed, the present invention is directed to a method of fabricating an electronic chip on a wafer. A first mask at a predetermined lower resolution is developed on a surface of a wafer. The first mask is etched under a first set of conditions for a predetermined period to achieve a higher resolution mask. The higher resolution is below 100 nm. The first set of conditions includes an a tuning parameter to independently control said line width variation tolerance of isolated features relative to nested features

The prior art fails to teach, suggest or render obvious the etching recipe of the present invention. The advantage of this recipe is that it achieves a resolution below 100nm, while concurrently providing a parameter (RF power level, see claim 12) that allows for independently tuning for line width variations between isolated features and nested features.

Moreover, the present invention has controllably achieved dimensions considerably lower than 100nm, currently including test samples now down to almost 30 nm.

None of the cited prior art provides a tuning parameter with the etching recipe of the specific invention.

II. THE 35 USC § 112 REJECTIONS

Claims 1-12 stand rejected under 35 USC § 112, first paragraph, as failing the written description requirement. As best understood, the Examiner continues to insist that Applicants are required to define a range in the claims over which the present invention applies, including a lower value. As best understood, the Examiner considers that such lower value is not described in the original specification and would, therefore, fail the written description requirement of 35 USC § 112, first paragraph.

In response, Applicants again submit that the plain language meaning of the independent claims merely defines an upper threshold over which the invention is being claimed. Stated slightly differently, Applicants are not precluding others from using the technique of the present invention for achieving critical dimensions above 100 nm.

The Examiner refers to MPEP §2163.05 III. However, Applicants respectfully submit that this section is irrelevant, since it applies to the case when an original specification has defined a range and the range defined in the claim(s) is changed.

This scenario does not apply in this case, since the original specification of the present invention made no attempt to establish a lower limit to a range. The only representation of the original specification was that the present invention allows critical dimensions below 100 nm, considered in the art as being a milestone. The present invention teaches one method to get below this milestone.

As Applicant has already stated on the record, the present invention has been demonstrated down to 40 nm. It has more recently been demonstrated down to about 30 nm. When compared to the critical dimensions that are presented in the prior art currently of record, these two numbers (e.g., 30 nm and 40 nm) are clearly very significant achievements, and the present invention is clearly a significant improvement in the art.

The Examiner is not authorized to deny protection of a significant improvement in the art by making up a new legal requirement that Applicants now define a lower range to the present invention, as based on MPEP §2163.05 III.

Applicants made no representation in the specification that such lower limit is known at the time of filing. Indeed, as of filing this Amendment, Applicants still do not know the lower limit of the capability of the present invention. Since no representation of a lower limit was made in the original disclosure, Applicants submit that the discussion in MPEP §2163.05 III is irrelevant and does not provide the basis for a new legal requirement that Applicants must now define a lower limit in the claims.

Finally, in response to the Examiner's question in paragraph 4 of page 3 of the Office Action: "While one of ordinary skill in the [art] would be able to determine that a dimension of 75 nm would read on the applicant's invention because of teachings in the specification, how would they be able to determine if, for example, 40 nm reads on it?", Applicants respond as follows:

The plain meaning of the language of the independent claims clearly defines 100 nm as the upper threshold value for which infringement would occur. Clearly, a critical dimension of 40 nm would infringe. Similarly, a critical dimension of 140 nm would not infringe because the invention has been defined in the independent claims as limited by the threshold value of 100 nm.

Accordingly, Applicants submit that the metes and bounds of the present invention are clearly defined in the claims by including the threshold value discussed in the specification as filed and respectfully request that the Examiner reconsider and withdraw the rejection for claims 1-12, based on 35 USC §112, first paragraph.

Relative to the indefiniteness rejection for claims 4-6, Applicants submit that the above amendment for claim 4 properly addresses the Examiner's concern. Accordingly, Applicants respectfully request that the Examiner reconsider and withdraw this rejection for claims 4-6, based on 35 USC §112, second paragraph.

III. THE PRIOR ART REJECTIONS

The Examiner alleges that claim 11 is obvious over US Patent 5,837,428 to Huang et al. As best understood, the Examiner considers that Huang teaches an oxygen/nitrogen flow ratio of 1.0-2.0 (based on a flow rate of oxygen of 5-20 sccm and a flow rate of nitrogen of 5-10 sccm), a pressure of 4 to 10 mTorr and RF setting of 200 to 400 W. The Examiner concedes that Huang teaches a critical dimension of 250 nm but fails to disclose being able to decrease the critical dimension down to 100 nm or less.

However, the Examiner also considers that "... critical dimensions is depend[ent] on various process conditions, such as photoresist type, exposure wavelength and etching conditions and is therefore a result-effective variable."

Therefore, according to the Examiner, "It would [be] within the ordinary skill of one in the art to determine the desired critical dimension in the method Huang by routine experimentation, such as using different exposure conditions to produce [a] smaller starting photoresist pattern, and to have critical dimension be less than 100 nm, if required, because critical dimension is a result effective variable and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch* (617 F.2d 272, 205 USPQ 215 (CCPA 1980))."

In response, Applicants submit that the Examiner's evaluation demonstrates an indication of a lack of understanding of terminology, logical reasoning, the present technology, and the significance of *Boesch*.

First, it is noted that the relative flow rates of 5-20 sccm and 5-10 sccm would yield a ratio range of 1.0 to 4.0, rather than 1.0 to 2.0, as alleged by the Examiner.

Second, Applicants submit that the Examiner seems confused by the term "result-effective variable", as discussed in *In re Antonie* and defined in MPEP §2144.05 II B as: "... a variable which achieves a recognized result." Applicants submit that, in the context of the present invention, the result is the critical dimension. The result-effective variables are the "... various process conditions, such as photoresist type, exposure wavelength and etching conditions " that the Examiner mentions above.

In the context of the present invention, the almost universal goal in microelectronics is the further miniaturization of chips, circuits, and devices. Therefore, the goal is almost always

the achievement of smaller critical dimensions. The present invention provides one method to get below the 100 nm critical dimension milestone.

To achieve this result, the present inventors have developed a technique and a precise etching recipes. The components of the technique and the ingredients of the etch recipes are the result-effective variables.

Third, *In re Antonie*, discussed briefly in MPEP §2144.05 II B, established the legal standard that a particular parameter must be first recognized as a result-effective variable before the determination of the optimum or workable ranges of a variable might be characterized as routine experimentation. *In re Boesch* is one example of the Court applying this standard.

In the context of the present invention and the evaluation in view of Huang, the Examiner would have the burden to establish that the prior art was aware of how the variables mentioned in Huang are used to produce an effect on the result (e.g., the critical dimension). There is no indication in Huang that one of ordinary skill would be able to know which parameter to modify and how to modify this parameter in order to get the smaller critical dimensions of the present invention.

At most, the Examiner would be asserting that it would be obvious to try different mixes of these variables.

That is, the Examiner identifies the ranges taught in Huang. These ranges clearly do not agree with the ranges taught by the present invention. Contrary to what seems to be the Examiner's position, Applicants submit that there is absolutely no clue in Huang that would permit one of ordinary skill in the art to know how to modify these specific ranges to improve critical dimensions from 250 nm to get down below 100 nm.

The Court in *In re Antonie* specifically addressed this issue: "*The PTO and the minority appear to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. As we have said many times, obvious to try is not the standard of 35 U.S.C. §103.*"

Stated slightly differently, given the ranges of the variables conceded by the Examiner as being taught in Huang, there is no indication in the reference or in the rejection currently of record that one of ordinary skill in the art would be motivated to modify these ranges to arrive at the different combination of ranges of the claimed invention. Nor is there any indication that one of ordinary skill in the art would be able to achieve a critical dimension below 100 nm, since the critical dimension asserted at lines 20-21 of column 9 of Huang is 250 nm. There is no suggestion in Huang that these ranges should be varied or in what manner one would go about varying them.

Therefore, Applicants submit that Huang fails to teach or suggest the etch variables described in claim 11.

Hence, turning to the clear language of the claim, in Huang there is teaching or suggestion of: "... said trimming process of said first mask comprises an oxygen and nitrogen plasma etch, in which: a flow ratio of oxygen to nitrogen is between 0.25 and 2.5; a setting of an RF power is in the range of 50 to 200 watts; and a setting of a pressure is between 10 and 45 mTorr."

Therefore, Applicants submit that claim 11 is clearly patentable over Huang.

Relative to the rejection for claim 12, the Examiner alleges that this claim is rendered obvious by US Patent 6,599,437 to Yauw et al. As best understood, the Examiner concedes that Yauw fails to teach a technique that expressly asserts that it can achieve a critical dimension below 100 nm. The Examiner also alleges that routine experimentation would cause a person of ordinary skill in the art to arrive at this critical dimension, using the technique of Yauw.

Applicants submit that, similar to the discussion above for Huang, the Examiner has failed to meet the initial burden for a *prima facie* rejection under 35 USC §103(a). The Examiner seems totally unaware that 100 nm is a milestone in critical dimension for integrated circuits. Applicants submit that, if Yauw were capable of going below 100 nm, there would be no reluctance to announce such result in a patent disclosure.

However, Applicants have rendered the issue moot by adding details of the etch into the claim. Therefore, whatever similarities may be present in Yauw with the present invention, it does not teach all of the etch parameters of the claim.

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For the reasons stated above, the claimed invention is fully patentable over the cited references.

Further, the other prior art of record has been reviewed, but it too, even in combination with Huang or Yauw, fails to teach or suggest the claimed invention.

III. FORMAL MATTERS AND CONCLUSION

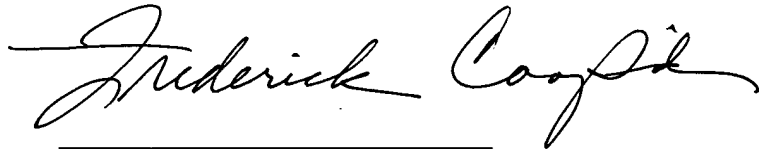
In view of the foregoing, Applicant submits that claims 1-12, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 09-0458.

Respectfully Submitted,

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Frederick E. Cooperrider
Reg. No. 36,769

McGinn & Gibb, PLLC
8321 Old Courthouse Road, Suite 200
Vienna, Virginia 22182
(703) 761-4100
Customer No. 21254